



IMAMURA 2005_0822A Revised Sequence Listing filed 2006-03-02
SEQUENCE LISTING

<110> IMAMURA, Hiromi
YOSHIDA, Masasuke
YOKOYAMA, Ken

<120> A Rotary Motor molecule V1-ATPase

<130> 2005_0822A/WMC/00653

<140> US 10/535,667

<141> 2005-05-19

<150> JP2002-337212

<151> 2002-11-20

<150> PCT/JP2003/012983

<151> 2003-10-09

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<170> PatentIn Ver. 2.1

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ctc	gcg	ggc	ctc	gag	ggc	tac	ggg	gcc	tct	tcg	gcg	gag	gag	gcc	caa	96
Leu	Ala	Gly	Leu	Glu	Gly	Tyr	Gly	Ala	Ser	Ser	Ala	Glu	Glu	Ala	Gln	
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agc	ctc	ctg	gaa	acc	ctc	gtg	gag	cgg	ggc	ggc	tac	gcc	ctg	gtg	gcc	144
Ser	Leu	Leu	Glu	Thr	Leu	Val	Glu	Arg	Gly	Gly	Tyr	Ala	Leu	Val	Ala	
		35					40					45				

gtg	gac	gag	gcg	ctc	ctc	ccc	gac	ccc	gag	cgg	gcg	gtg	gag	cgc	ctc	192
Val	Asp	Glu	Ala	Leu	Leu	Pro	Asp	Pro	Glu	Arg	Ala	Val	Glu	Arg	Leu	
	50					55					60					

atg	cgg	ggc	agg	gac	ctc	ccc	gtg	ctc	ctg	ccc	atc	gcg	ggg	ctg	aag	240
Met	Arg	Gly	Arg	Asp	Leu	Pro	Val	Leu	Leu	Pro	Ile	Ala	Gly	Leu	Lys	

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75

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Glu Ala Phe Gln Gly His Asp Val Glu Gly Tyr Met Arg Glu Leu Val
85 90 95

agg aag acc atc ggc ttt gac atc aag ctg tagaatggag ggacg atg atc 339
Arg Lys Thr Ile Gly Phe Asp Ile Lys Leu Met Ile
100 105

caa ggg gtg atc cag aag atc gcg ggc ccg gcg gtg atc gcc aag ggc 387
Gln Gly Val Ile Gln Lys Ile Ala Gly Pro Ala Val Ile Ala Lys Gly
110 115 120

atg ctc ggg gcc cgc atg tac gac atc tgc aag gtg ggc gaa gag ggc 435
Met Leu Gly Ala Arg Met Tyr Asp Ile Cys Lys Val Gly Glu Glu Gly
125 130 135 140

ctc gtg ggc gag atc atc cgc ctg gac ggg gac acg gcc ttc gtc cag 483
Leu Val Gly Glu Ile Ile Arg Leu Asp Gly Asp Thr Ala Phe Val Gln
145 150 155

gtc tac gag gac acc tcg ggc cta aag gtg ggg gag ccc gtg gtc tcc 531
Val Tyr Glu Asp Thr Ser Gly Leu Lys Val Gly Glu Pro Val Val Ser

acg ggg ctt ccc ttg gcg gtg gag ctc ggc ccc ggg atg ctg aac ggc 579
Thr Gly Leu Pro Leu Ala Val Glu Leu Gly Pro Gly Met Leu Asn Gly
175 180 185

atc tac gac ggc atc cag cgc ccc ctg gag cgc atc cgg gag aag acg 627
Ile Tyr Asp Gly Ile Gln Arg Pro Leu Glu Arg Ile Arg Glu Lys Thr
190 195 200

ggg atc tac atc acc cgg ggc gtg gtg gtc cac gcc ctg gac cgg gag 675
Gly Ile Tyr Ile Thr Arg Gly Val Val Val His Ala Leu Asp Arg Glu
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Lys Lys Trp Ala Trp Thr Pro Met Val Lys Pro Gly Asp Glu Val Arg
225 230 235

ggg ggt atg gtc ctg ggc acg gtg ccc gag ttc ggc ttc acc cac aag 771
Gly Gly Met Val Leu Gly Thr Val Pro Glu Phe Gly Phe Thr His Lys
240 245 250

atc ctg gta ccc ccg gac gtg cgg ggc cgg gtc aag gag gtg aag ccc 819
Ile Leu Val Pro Pro Asp Val Arg Gly Arg Val Lys Glu Val Lys Pro
255 260 265

gcc ggg gag tac acc gtg gag gag ccg gtg gtg gtc ctc gag gac ggc 867
Ala Gly Glu Tyr Thr Val Glu Glu Pro Val Val Val Leu Glu Asp Gly

acc gag ctc aag atg tac cac acc tgg ccc gtt cgc cgg gcg agg ccc 915
Thr Glu Leu Lys Met Tyr His Thr Trp Pro Val Arg Arg Ala Arg Pro
285 290 295 300

gtg caa agg aag ctt gac ccc aac acc ccc ttc ctc acg ggg atg cgc 963
Val Gln Arg Lys Leu Asp Pro Asn Thr Pro Phe Leu Thr Gly Met Arg
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atc ctg gac gtc ctc ttc ccc gtg gcc atg ggg ggc acc gcc gcc atc 1011

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Pro	Gly	Pro	Phe	Gly	Ser	Gly	Lys	Thr	Val	Thr	Gln	Gln	Ser	Leu	Ala	
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aag	tgg	tcc	aac	gcc	gac	gtg	gtg	gtc	tac	gtg	ggc	tgc	ggg	gag	cgg	1107
Lys	Trp	Ser	Asn	Ala	Asp	Val	Val	Val	Tyr	Val	Gly	Cys	Gly	Glu	Arg	
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ggg	aac	gag	atg	acc	gac	gtg	ctc	gtg	gag	ttc	ccc	gag	ctc	acc	gac	1155
Gly	Asn	Glu	Met	Thr	Asp	Val	Leu	Val	Glu	Phe	Pro	Glu	Leu	Thr	Asp	
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ccc	aag	acg	ggg	ggg	ccc	ttg	atg	cac	cgc	acc	gtc	ctc	atc	gcc	aac	1203
Pro	Lys	Thr	Gly	Gly	Pro	Leu	Met	His	Arg	Thr	Val	Leu	Ile	Ala	Asn	
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acc	tcc	aac	atg	ccc	gtg	gcc	gcc	cgc	gag	gcc	agc	atc	tac	gtg	ggc	1251
Thr	Ser	Asn	Met	Pro	Val	Ala	Ala	Arg	Glu	Ala	Ser	Ile	Tyr	Val	Gly	
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gtg	acc	atc	gcc	gag	tac	ttc	cgc	gac	cag	ggc	ttc	tcc	gtg	gcc	ctc	1299
Val	Thr	Ile	Ala	Glu	Tyr	Phe	Arg	Asp	Gln	Gly	Phe	Ser	Val	Ala	Leu	
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Met	Ala	Asp	Ser	Thr	Ser	Arg	Trp	Ala	Glu	Ala	Leu	Arg	Glu	Ile	Ser	
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Ser	Arg	Leu	Glu	Glu	Met	Pro	Ala	Glu	Glu	Gly	Tyr	Pro	Pro	Tyr	Leu	
445					450					455					460	
gcc	gcc	agg	ctc	gcc	gcc	ttc	tac	gag	cgg	gcg	ggc	aag	gtc	atc	acc	1443
Ala	Ala	Arg	Leu	Ala	Ala	Phe	Tyr	Glu	Arg	Ala	Gly	Lys	Val	Ile	Thr	
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ctg	ggc	ggc	gag	gag	ggg	gcg	gtg	acc	atc	gtg	ggg	gcc	gtc	tcc	ccg	1491
Leu	Gly	Gly	Glu	Glu	Gly	Ala	Val	Thr	Ile	Val	Gly	Ala	Val	Ser	Pro	
			480					485					490			
ccg	ggc	ggc	gac	atg	tcc	gag	ccc	gtg	acc	cag	tcc	acc	ttg	agg	atc	1539
Pro	Gly	Gly	Asp	Met	Ser	Glu	Pro	Val	Thr	Gln	Ser	Thr	Leu	Arg	Ile	
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Val	Gly	Ala	Phe	Trp	Arg	Leu	Asp	Ala	Ser	Leu	Ala	Phe	Arg	Arg	His	
	510					515					520					
ttc	ccc	gcc	atc	aac	tgg	aac	ggc	tcc	tac	agc	ctc	ttc	acc	tcc	gcc	1635
Phe	Pro	Ala	Ile	Asn	Trp	Asn	Gly	Ser	Tyr	Ser	Leu	Phe	Thr	Ser	Ala	
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ctt	gac	ccc	tgg	tac	cgg	gag	aac	gtg	gcc	gag	gac	tac	ccc	gag	ctc	1683
Leu	Asp	Pro	Trp	Tyr	Arg	Glu	Asn	Val	Ala	Glu	Asp	Tyr	Pro	Glu	Leu	
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cgc	gac	gcc	atc	tcc	gag	ctt	ttg	cag	cgg	gag	gcg	ggc	ctc	cag	gag	1731
Arg	Asp	Ala	Ile	Ser	Glu	Leu	Leu	Gln	Arg	Glu	Ala	Gly	Leu	Gln	Glu	
			560					565					570			

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Ile Val Gln Leu Val Gly Pro Asp Ala Leu Gln Asp Ala Glu Arg Leu	
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gtc att gag gtg ggc cgg atc atc cgc gag gac ttc ctg cag cag aac	1827
Val Ile Glu Val Gly Arg Ile Ile Arg Glu Asp Phe Leu Gln Gln Asn	
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gcc tac cac gag gtg gac gcc tac tgc tcc atg aag aag gcc tac ggg	1875
Ala Tyr His Glu Val Asp Ala Tyr Cys Ser Met Lys Lys Ala Tyr Gly	
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cgc atc ggc cgc gcc cgc tac gtg agc gag gag gag ttc ccc gcc tac	2019
Arg Ile Gly Arg Ala Arg Tyr Val Ser Glu Glu Glu Phe Pro Ala Tyr	
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taaaggggga gag atg gac ctt ctg aag aag gag tac acg ggc atc acc	2116
Met Asp Leu Leu Lys Lys Glu Tyr Thr Gly Ile Thr	
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Tyr Ile Ser Gly Pro Leu Leu Phe Val Glu Asn Ala Lys Asp Leu Ala	
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Gly Gln Val Ile Glu Val Ser Glu Glu Tyr Ala Val Ile Gln Val Phe	
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gag gaa acc act ggg ctg gac ctg gcc acg acc agc gtg agc ctg gtg	2308
Glu Glu Thr Thr Gly Leu Asp Leu Ala Thr Thr Ser Val Ser Leu Val	
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gag gac gtg gcc cgg ctt ggg gtc tcc aag gag atg ctg ggc cgc cgc	2356
Glu Asp Val Ala Arg Leu Gly Val Ser Lys Glu Met Leu Gly Arg Arg	
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ttc aac ggc atc ggc aag ccc ata gac ggc ctg ccg ccc atc acc ccg	2404
Phe Asn Gly Ile Gly Lys Pro Ile Asp Gly Leu Pro Pro Ile Thr Pro	
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gag aag cgg ctc ccc atc acc ggc ctt ccc tta aac ccc gtg gcc cgg	2452
Glu Lys Arg Leu Pro Ile Thr Gly Leu Pro Leu Asn Pro Val Ala Arg	
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agg aag ccg gag cag ttc atc cag acg ggc atc tcc acc att gac gtg	2500
Arg Lys Pro Glu Gln Phe Ile Gln Thr Gly Ile Ser Thr Ile Asp Val	
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815	
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Met Asn Thr Leu Val Arg Gly Gln Lys Leu Pro Ile Phe Ser Gly Ser	
825 830 835 840	
ggg ctt ccc gcc aac gag atc gcc gcc cag atc gcc cgc cag gcc acg	2596
Gly Leu Pro Ala Asn Glu Ile Ala Ala Gln Ile Ala Arg Gln Ala Thr	
845 850 855	
gtg cgc ccc gac ctc tcc ggg gag ggg gag aag gag gag ccc ttc gcc	2644
Val Arg Pro Asp Leu Ser Gly Glu Gly Glu Lys Glu Glu Pro Phe Ala	
860 865 870	
gtg gtc ttc gcc gcc atg ggg atc acg cag cgg gag ctc tcc tac ttc	2692
Val Val Phe Ala Ala Met Gly Ile Thr Gln Arg Glu Leu Ser Tyr Phe	
875 880 885	
atc cag gag ttt gag cgc acc ggg gcc ctg agc cgc tcc gtc ctc ttc	2740
Ile Gln Glu Phe Glu Arg Thr Gly Ala Leu Ser Arg Ser Val Leu Phe	
890 895 900	
ctg aac aag gcg gac gac ccc acc att gag cgc atc ctc acc ccc cgc	2788
Leu Asn Lys Ala Asp Asp Pro Thr Ile Glu Arg Ile Leu Thr Pro Arg	
905 910 915 920	
atg gcc ctc acc gtg gcc gag tac ctg gcc ttt gag cac gac tac cac	2836
Met Ala Leu Thr Val Ala Glu Tyr Leu Ala Phe Glu His Asp Tyr His	
925 930 935	
gtc ctc gtc atc ctc acg gac atg acc aac tac tgc gag gcc ttg cgg	2884
Val Leu Val Ile Leu Thr Asp Met Thr Asn Tyr Cys Glu Ala Leu Arg	
940 945 950	
gag atc ggg gcc gcc cgc gag gag atc ccg ggc cgc cgc ggt tac ccc	2932
Glu Ile Gly Ala Ala Arg Glu Glu Ile Pro Gly Arg Arg Gly Tyr Pro	
955 960 965	
ggc tac atg tac acc gac ctg gcc acc atc tac gag cgc gcc ggg gtg	2980
Gly Tyr Met Tyr Thr Asp Leu Ala Thr Ile Tyr Glu Arg Ala Gly Val	
970 975 980	
gtg gag ggg aag aag ggg agc gtg acc cag atc ccc atc ctc tcc atg	3028
Val Glu Gly Lys Lys Gly Ser Val Thr Gln Ile Pro Ile Leu Ser Met	
985 990 995 1000	
ccc gac gac gac cgc acc cac ccc atc ccc gag ctc acg ggc tac atc	3076
Pro Asp Asp Asp Arg Thr His Pro Ile Pro Asp Leu Thr Gly Tyr Ile	
1005 1010 1015	
acc gag ggg cag atc cag ctc tcc cgg gag ctc cac cgc aag ggc atc	3124
Thr Glu Gly Gln Ile Gln Leu Ser Arg Glu Leu His Arg Lys Gly Ile	
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tac ccg ccc att gac ccc ttg ccc tcc ctc tcc cgg ctc atg aac aac	3172
Tyr Pro Pro Ile Asp Pro Leu Pro Ser Leu Ser Arg Leu Met Asn Asn	
1035 1040 1045	
ggc gtg ggc aag ggc aag acc cgg gag gag cac aag cag gtc tcc gac	3220
Gly Val Gly Lys Gly Lys Thr Arg Glu Asp His Lys Gln Val Ser Asp	
1050 1055 1060	
cag ctc tac tcc gcc tac gcc aac ggg gtg gag atc cgg aag ctc gtg	3268
Gln Leu Tyr Ser Ala Tyr Ala Asn Gly Val Asp Ile Arg Lys Leu Val	

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gcc atc atc ggc gag gac gcc ctc acg gag aac gac cgc cgt tac ctc				3316
Ala Ile Ile Gly Glu Asp Ala Leu Thr Glu Asn Asp Arg Arg Tyr Leu	1085	1090	1095	
cag ttc gcc gac gcc ttt gaa cgg ttc ttc atc aac cag ggg cag cag				3364
Gln Phe Ala Asp Ala Phe Glu Arg Phe Phe Ile Asn Gln Gly Gln Gln	1100	1105	1110	
aac cgc tcc att gag gag agc ctg cag atc gcc tgg gcc ctc ctc tcc				3412
Asn Arg Ser Ile Glu Glu Ser Leu Gln Ile Ala Trp Ala Leu Leu Ser	1115	1120	1125	
atg ctg ccc cag ggc gag ctc aag cgc atc tcc aag gac cac atc ggc				3460
Met Leu Pro Gln Gly Glu Leu Lys Arg Ile Ser Lys Asp His Ile Gly	1130	1135	1140	
aag tac tac ggc cag aag ctg gag gag atc tgg ggc gcg ccc cag gcc				3508
Lys Tyr Tyr Gly Gln Lys Leu Glu Glu Ile Trp Gly Ala Pro Gln Ala	1145	1150	1155	1160
ctg gac taagggaggg tag atg agc cag gtg agc ccc acc cgg atg aac				3557
Leu Asp Met Ser Gln Val Ser Pro Thr Arg Met Asn	1165	1170		
ctt ctg cag agg cgg ggg cag ctc cgc ctg gcg cag aag ggg gtg gac				3605
Leu Leu Gln Arg Arg Gly Gln Leu Arg Leu Ala Gln Lys Gly Val Asp	1175	1180	1185	
ctc ctc aag aag aag cgg gac gcc ctg gtg gcc gag ttc ttc ggc ctg				3653
Leu Leu Lys Lys Lys Arg Asp Ala Leu Val Ala Glu Phe Phe Gly Leu	1190	1195	1200	
gtg cgg gag gcc atg gag gcc agg aag gcc ctg gac cag gcg gcc aag				3701
Val Arg Glu Ala Met Glu Ala Arg Lys Ala Leu Asp Gln Ala Ala Lys	1205	1210	1215	1220
gag gcc tac gcc gcc ctc ctc ctg gcc cag gcc ttt gac ggg ccg gag				3749
Glu Ala Tyr Ala Ala Leu Leu Leu Ala Gln Ala Phe Asp Gly Pro Glu	1225	1230	1235	
gtg gtg gcg ggg gcg gcc ctt ggg gtc ccg ccc ctc gag ggg gtg gag				3797
Val Val Ala Gly Ala Ala Leu Gly Val Pro Pro Leu Glu Gly Val Glu	1240	1245	1250	
gcg gag gtg gag aac gtc tgg ggg agc aag gtg ccg agg ctc aag gcc				3845
Ala Glu Val Glu Asn Val Trp Gly Ser Lys Val Pro Arg Leu Lys Ala	1255	1260	1265	
acc ttc ccc gac ggg gcc ctc ctt tcc ccg gtg ggg acc ccg gcc tac				3893
Thr Phe Pro Asp Gly Ala Leu Leu Ser Pro Val Gly Thr Pro Ala Tyr	1270	1275	1280	
acc ctc gag gcc agc cgg gcc ttc cgc cgc tac gcc gag gcc ctg atc				3941
Thr Leu Glu Ala Ser Arg Ala Phe Arg Arg Tyr Ala Glu Ala Leu Ile	1285	1290	1295	1300
cgg gtg gcc aac acc gag acc cgc ctg aag aag atc ggg gag gag atc				3989
Arg Val Ala Asn Thr Glu Thr Arg Leu Lys Lys Ile Gly Glu Glu Ile	1305	1310	1315	
aag aag acc acg cgg cgg gtg aac gcc ctg gag cag gtg gtg atc ccg				4037

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Lys Lys Thr Thr Arg Arg Val Asn Ala Leu Glu Gln Val Val Ile Pro
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ggg atc cgc gcc cag atc cgc ttc atc cag cag gtc ctg gag cag cgg 4085
 Gly Ile Arg Ala Gln Ile Arg Phe Ile Gln Gln Val Leu Glu Gln Arg
 1335 1340 1345

gaa cgg gag gac acc ttc cgc ctc aag cgc atc aag ggc aag att gag 4133
 Glu Arg Glu Asp Thr Phe Arg Leu Lys Arg Ile Lys Gly Lys Ile Glu
 1350 1355 1360

gcc cgg gag gcc gag gag gag ggc ggc cgg ccc aac ccg cag gtg gag 4181
 Ala Arg Glu Ala Glu Glu Glu Gly Gly Arg Pro Asn Pro Gln Val Glu
 1365 1370 1375 1380

atc ggg gcg ggc ctt taa 4199
 Ile Gly Ala Gly Leu
 1385

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 20 25 30
 Ser Leu Leu Glu Thr Leu Val Glu Arg Gly Gly Tyr Ala Leu Val Ala
 35 40 45
 Val Asp Glu Ala Leu Leu Pro Asp Pro Glu Arg Ala Val Glu Arg Leu
 50 55 60
 Met Arg Gly Arg Asp Leu Pro Val Leu Leu Pro Ile Ala Gly Leu Lys
 65 70 75 80
 Glu Ala Phe Gln Gly His Asp Val Glu Gly Tyr Met Arg Glu Leu Val
 85 90 95
 Arg Lys Thr Ile Gly Phe Asp Ile Lys Leu
 100 105

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 Lys Gly Met Leu Gly Ala Arg Met Tyr Asp Ile Cys Lys Val Gly Glu
 20 25 30
 Glu Gly Leu Val Gly Glu Ile Ile Arg Leu Asp Gly Asp Thr Ala Phe
 35 40 45
 Val Gln Val Tyr Glu Asp Thr Ser Gly Leu Lys Val Gly Glu Pro Val
 50 55 60
 Val Ser Thr Gly Leu Pro Leu Ala Val Glu Leu Gly Pro Gly Met Leu
 65 70 75 80
 Asn Gly Ile Tyr Asp Gly Ile Gln Arg Pro Leu Glu Arg Ile Arg Glu
 85 90 95
 Lys Thr Gly Ile Tyr Ile Thr Arg Gly Val Val Val His Ala Leu Asp
 100 105 110
 Arg Glu Lys Lys Trp Ala Trp Thr Pro Met Val Lys Pro Gly Asp Glu

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Val	Arg	Gly	Gly	Met	Val	Leu	Gly	Thr	Val	Pro	Glu	Phe	Gly	Phe	Thr
130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205
His	Lys	Ile	Leu	Val	Pro	Pro	Asp	Val	Arg	Gly	Arg	Val	Lys	Glu	Val
145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
Lys	Pro	Ala	Gly	Glu	Tyr	Thr	Val	Glu	Glu	Pro	Val	Val	Val	Leu	Glu
165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
Asp	Gly	Thr	Glu	Leu	Lys	Met	Tyr	His	Thr	Trp	Pro	Val	Arg	Arg	Ala
180	185	190	195	200	205	210	215	220	225	230	235	240	245	250	255
Arg	Pro	Val	Gln	Arg	Lys	Leu	Asp	Pro	Asn	Thr	Pro	Phe	Leu	Thr	Gly
195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270
Met	Arg	Ile	Leu	Asp	Val	Leu	Phe	Pro	Val	Ala	Met	Gly	Gly	Thr	Ala
210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285
Ala	Ile	Pro	Gly	Pro	Phe	Gly	Ser	Gly	Lys	Thr	Val	Thr	Gln	Gln	Ser
225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
Leu	Ala	Lys	Trp	Ser	Asn	Ala	Asp	Val	Val	Val	Tyr	Val	Gly	Cys	Gly
245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
Glu	Arg	Gly	Asn	Glu	Met	Thr	Asp	Val	Leu	Val	Glu	Phe	Pro	Glu	Leu
260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335
Thr	Asp	Pro	Lys	Thr	Gly	Gly	Pro	Leu	Met	His	Arg	Thr	Val	Leu	Ile
275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
Ala	Asn	Thr	Ser	Asn	Met	Pro	Val	Ala	Ala	Arg	Glu	Ala	Ser	Ile	Tyr
290	295	300	305	310	315	320	325	330	335	340	345	350	355	360	365
Val	Gly	Val	Thr	Ile	Ala	Glu	Tyr	Phe	Arg	Asp	Gln	Gly	Phe	Ser	Val
305	310	315	320	325	330	335	340	345	350	355	360	365	370	375	380
Ala	Leu	Met	Ala	Asp	Ser	Thr	Ser	Arg	Trp	Ala	Glu	Ala	Leu	Arg	Glu
325	330	335	340	345	350	355	360	365	370	375	380	385	390	395	400
Ile	Ser	Ser	Arg	Leu	Glu	Glu	Met	Pro	Ala	Glu	Glu	Gly	Tyr	Pro	Pro
340	345	350	355	360	365	370	375	380	385	390	395	400	405	410	415
Tyr	Leu	Ala	Ala	Arg	Leu	Ala	Ala	Phe	Tyr	Glu	Arg	Ala	Gly	Lys	Val
355	360	365	370	375	380	385	390	395	400	405	410	415	420	425	430
Ile	Thr	Leu	Gly	Gly	Glu	Glu	Gly	Ala	Val	Thr	Ile	Val	Gly	Ala	Val
370	375	380	385	390	395	400	405	410	415	420	425	430	435	440	445
Ser	Pro	Pro	Gly	Gly	Asp	Met	Ser	Glu	Pro	Val	Thr	Gln	Ser	Thr	Leu
385	390	395	400	405	410	415	420	425	430	435	440	445	450	455	460
Arg	Ile	Val	Gly	Ala	Phe	Trp	Arg	Leu	Asp	Ala	Ser	Leu	Ala	Phe	Arg
405	410	415	420	425	430	435	440	445	450	455	460	465	470	475	480
Arg	His	Phe	Pro	Ala	Ile	Asn	Trp	Asn	Gly	Ser	Tyr	Ser	Leu	Phe	Thr
420	425	430	435	440	445	450	455	460	465	470	475	480	485	490	495
Ser	Ala	Leu	Asp	Pro	Trp	Tyr	Arg	Glu	Asn	Val	Ala	Glu	Asp	Tyr	Pro
435	440	445	450	455	460	465	470	475	480	485	490	495	500	505	510
Glu	Leu	Arg	Asp	Ala	Ile	Ser	Glu	Leu	Leu	Gln	Arg	Glu	Ala	Gly	Leu
450	455	460	465	470	475	480	485	490	495	500	505	510	515	520	525
Gln	Glu	Ile	Val	Gln	Leu	Val	Gly	Pro	Asp	Ala	Leu	Gln	Asp	Ala	Glu
465	470	475	480	485	490	495	500	505	510	515	520	525	530	535	540
Arg	Leu	Val	Ile	Glu	Val	Gly	Arg	Ile	Ile	Arg	Glu	Asp	Phe	Leu	Gln
485	490	495	500	505	510	515	520	525	530	535	540	545	550	555	560
Gln	Asn	Ala	Tyr	His	Glu	Val	Asp	Ala	Tyr	Cys	Ser	Met	Lys	Lys	Ala
500	505	510	515	520	525	530	535	540	545	550	555	560	565	570	575
Tyr	Gly	Ile	Met	Lys	Met	Ile	Leu	Ala	Phe	Tyr	Lys	Glu	Ala	Glu	Ala
515	520	525	530	535	540	545	550	555	560	565	570	575	580	585	590
Ala	Ile	Lys	Arg	Gly	Val	Ser	Ile	Asp	Glu	Ile	Leu	Gln	Leu	Pro	Val
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Leu	Glu	Arg	Ile	Gly	Arg	Ala	Arg	Tyr	Val	Ser	Glu	Glu	Glu	Phe	Pro
545	550	555	560	565	570	575	580	585	590	595	600	605	610	615	620
Ala	Tyr	Phe	Glu	Glu	Ala	Met	Lys	Glu	Ile	Gln	Gly	Ala	Phe	Lys	Ala
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Leu	Ala														

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<213> *Thermus thermophilus*

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Val Asp Ile Lys Asp Gly Thr Gly Arg Val Arg Gly Gly Gln Val Ile
 35      40      45
Glu Val Ser Glu Glu Tyr Ala Val Ile Gln Val Phe Glu Glu Thr Thr
 50      55      60
Gly Leu Asp Leu Ala Thr Thr Ser Val Ser Leu Val Glu Asp Val Ala
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Arg Leu Gly Val Ser Lys Glu Met Leu Gly Arg Arg Phe Asn Gly Ile
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Gly Lys Pro Ile Asp Gly Leu Pro Pro Ile Thr Pro Glu Lys Arg Leu
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Pro Ile Thr Gly Leu Pro Leu Asn Pro Val Ala Arg Arg Lys Pro Glu
115      120      125
Gln Phe Ile Gln Thr Gly Ile Ser Thr Ile Asp Val Met Asn Thr Leu
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Val Arg Gly Gln Lys Leu Pro Ile Phe Ser Gly Ser Gly Leu Pro Ala
145      150      155      160
Asn Glu Ile Ala Ala Gln Ile Ala Arg Gln Ala Thr Val Arg Pro Asp
165      170      175
Leu Ser Gly Glu Gly Glu Lys Glu Glu Pro Phe Ala Val Val Phe Ala
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Ala Met Gly Ile Thr Gln Arg Glu Leu Ser Tyr Phe Ile Gln Glu Phe
195      200      205
Glu Arg Thr Gly Ala Leu Ser Arg Ser Val Leu Phe Leu Asn Lys Ala
210      215      220
Asp Asp Pro Thr Ile Glu Arg Ile Leu Thr Pro Arg Met Ala Leu Thr
225      230      235      240
Val Ala Glu Tyr Leu Ala Phe Glu His Asp Tyr His Val Leu Val Ile
245      250      255
Leu Thr Asp Met Thr Asn Tyr Cys Glu Ala Leu Arg Glu Ile Gly Ala
260      265      270
Ala Arg Glu Glu Ile Pro Gly Arg Arg Gly Tyr Pro Gly Tyr Met Tyr
275      280      285
Thr Asp Leu Ala Thr Ile Tyr Glu Arg Ala Gly Val Val Glu Gly Lys
290      295      300
Lys Gly Ser Val Thr Gln Ile Pro Ile Leu Ser Met Pro Asp Asp Asp
305      310      315      320
Arg Thr His Pro Ile Pro Asp Leu Thr Gly Tyr Ile Thr Glu Gly Gln
325      330      335
Ile Gln Leu Ser Arg Glu Leu His Arg Lys Gly Ile Tyr Pro Pro Ile
340      345      350
Asp Pro Leu Pro Ser Leu Ser Arg Leu Met Asn Asn Gly Val Gly Lys
355      360      365
Gly Lys Thr Arg Glu Asp His Lys Gln Val Ser Asp Gln Leu Tyr Ser
370      375      380
Ala Tyr Ala Asn Gly Val Asp Ile Arg Lys Leu Val Ala Ile Ile Gly
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Glu Asp Ala Leu Thr Glu Asn Asp Arg Arg Tyr Leu Gln Phe Ala Asp
405      410      415
Ala Phe Glu Arg Phe Phe Ile Asn Gln Gly Gln Gln Asn Arg Ser Ile
420      425      430
Glu Glu Ser Leu Gln Ile Ala Trp Ala Leu Leu Ser Met Leu Pro Gln
435      440      445
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 35 40 45
 Ala Arg Lys Ala Leu Asp Gln Ala Ala Lys Glu Ala Tyr Ala Ala Leu
 50 55 60
 Leu Leu Ala Gln Ala Phe Asp Gly Pro Glu Val Val Ala Gly Ala Ala
 65 70 75 80
 Leu Gly Val Pro Pro Leu Glu Gly Val Glu Ala Glu Val Glu Asn Val
 85 90 95
 Trp Gly Ser Lys Val Pro Arg Leu Lys Ala Thr Phe Pro Asp Gly Ala
 100 105 110
 Leu Leu Ser Pro Val Gly Thr Pro Ala Tyr Thr Leu Glu Ala Ser Arg
 115 120 125
 Ala Phe Arg Arg Tyr Ala Glu Ala Leu Ile Arg Val Ala Asn Thr Glu
 130 135 140
 Thr Arg Leu Lys Lys Ile Gly Glu Glu Ile Lys Lys Thr Thr Arg Arg
 145 150 155 160
 Val Asn Ala Leu Glu Gln Val Val Ile Pro Gly Ile Arg Ala Gln Ile
 165 170 175
 Arg Phe Ile Gln Gln Val Leu Glu Gln Arg Glu Arg Glu Asp Thr Phe
 180 185 190
 Arg Leu Lys Arg Ile Lys Gly Lys Ile Glu Ala Arg Glu Ala Glu Glu
 195 200 205
 Glu Gly Gly Arg Pro Asn Pro Gln Val Glu Ile Gly Ala Gly Leu
 210 215 220